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DAMASCUS CITIZENS FOR SUSTAINABILITY, INC. • DELAWARE RIVERKEEPER NETWORK •  
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GAS ACCOUNTABILITY PROJECT, A PROGRAM OF EARTHWORKS • OPEN SPACE INSTITUTE • OTSEGO  
COUNTY CONSERVATION ASSOCIATION • RIVERKEEPER, INC. • SIERRA CLUB ATLANTIC CHAPTER •  
THEODORE GORDON FLYFISHERS, INC.

December 15, 2008

Attn: Scope Comments  
Bureau of Oil & Gas Regulation  
NYSDEC Division of Mineral Resources  
625 Broadway, Third Floor  
Albany, NY 12233-6500

**Re: *Comments on the New York State Department of Environmental  
Conservation's Draft Scope for the Draft Supplemental Generic Environmental  
Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program***

Dear Sir or Madam:

The undersigned groups endorse and submit the attached comments prepared by Natural Resources Defense Council and its consultants, with substantial input from Earthjustice, Catskill Mountainkeeper, Riverkeeper, Inc., the Delaware Riverkeeper Network, the Sierra Club Atlantic Chapter, and the Open Space Institute, on the Draft Scope for the Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program: Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs.

Thank you for your consideration of these comments. We look forward to working with you as this process moves forward.

Sincerely,

Stephanie Lindloff, Senior Director  
American Rivers

Sean Mahar, Director of Government Relations and Communications  
Audubon New York

Scott Lauffer & Laura Seltz, Co-chairs  
Gas Production Task Force  
Binghamton Regional Sustainability Coalition

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NATURAL RESOURCES DEFENSE COUNCIL

December 15, 2008

Attn: Scope Comments  
Bureau of Oil & Gas Regulation  
NYSDEC Division of Mineral Resources  
625 Broadway  
Albany, New York 12233-6500

Re: Comments on Draft Scope of Work for  
Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing  
To Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs

Dear Sir or Madam:

The following comments were prepared by the Natural Resources Defense Council (NRDC) and its consultants, with substantial input from Earthjustice, Catskill Mountainkeeper, Riverkeeper, Inc., the Delaware Riverkeeper Network, Sierra Club, Atlantic Chapter, and The Open Space Institute, on the Draft Scope of Work for the Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (Draft Scope of Work). These comments are intended to help the New York State Department of Environmental Conservation (NYS DEC or Department) revise the Draft Scope of Work to ensure that the Supplemental Generic Environmental Impact Statement (SGEIS) will (1) disclose and evaluate all of the potential environmental impacts from developing natural gas resources from the Marcellus Shale and other low permeability gas reservoirs using horizontal drilling and high-volume hydraulic fracturing; (2) comprehensively evaluate the regulations that currently govern such development (the Regulatory Program), and the Department's enforcement capacity and practices to determine whether they adequately protect the environment and public health and safety from this industrial-type activity; (3) thoroughly explore best management practices and potential mitigation measures, including regulatory revisions that will ensure safe and environmentally benign development; and (4) carefully analyze reasonable alternatives to full development and to the current Regulatory Program.

This letter is divided into two sections. The first section contains overarching concepts to be addressed in the Scope of Work and in the SGEIS in order for the document to serve the purposes outlined above and comply with the State Environmental Quality Review Act (SEQRA). The second section provides more detailed comments in each technical area of analysis that must be addressed in the SGEIS.

## **A. OVERARCHING COMMENTS**

1. The Draft Scope of Work does not specify precisely which "other low permeability gas reservoirs in the state" beyond the Marcellus Shale are proposed to be analyzed in the SGEIS. Any such reservoirs must be identified by name and location so that the sufficiency of the proposed analyses in the SGEIS can be properly evaluated. Throughout the remainder of this document, we comment on the Draft Scope of Work as it applies exclusively to the Marcellus Shale formation because of our inability to evaluate whether different and/or additional analyses would be appropriate in the context of the proposed development of other low permeability gas reservoirs in the state.

2. The Draft Scope of Work's description of the proposed action suggests that the action consists of a series of unrelated, discrete projects, each of which is restricted to the activities at one well pad. Instead, the proposed action must properly be described as being the overall statewide program to administer gas drilling in the Marcellus Shale. As currently written, the Draft Scope of Work's definition of the proposed action is an unjustifiably narrow formulation that will result in unlawful segmentation and a corresponding understatement of the potential significant adverse environmental impacts of the proposed action, i.e., the statewide permitting of horizontal wells using hydraulic fracturing in the Marcellus and similar formations in New York State.
3. In accordance with a proper formulation of the proposed action, the impact analysis needs to be performed on three levels: local, regional, and state-wide cumulative. The local level that should be analyzed is similar to what is currently contemplated; one well pad (as opposed to one well) and its localized effects. From this perspective, NYS DEC can determine local impacts and develop setbacks from sensitive receptors and resources, and other mitigation measures and best practices. However, analysis of local impacts associated with a one-well pad situation does not adequately disclose the regional or cumulative impacts which would result from the overall development of the Marcellus Shale.

Second, NYS DEC must develop a generic reasonable worst case scenario of area-wide development of the Marcellus Shale as a particular gas-rich section is identified and intensely developed over a period of several years followed by re-fracturing for secondary and tertiary production over a period of several decades. This scenario reflects the type of development that occurred in Chautauqua County, where Chautauqua Energy has about 180 wells. Production started in the 1970's and is continuing to this day. However, development of these wells occurred in clusters of time with many drilled in the early 1980's. This pattern has also occurred in similar circumstances in other regions of the country, including the Barnett Shale Formation in Texas and Oklahoma, and is anticipated in Pennsylvania and other states with Marcellus Shale.

After the generic regional scenario and its potential impacts are analyzed, the scenario needs to be evaluated for sensitive areas. For example, what would the regional effects be if the development were located in the New York City watershed, in the Catskills, in an urban area, in the Binghamton-Johnson City Aquifer, in an air quality non-attainment area, etc.? Certain activities would likely cause unacceptable impacts in some of these sensitive areas.

The last analysis that needs to be performed is cumulative on a state-wide basis. Consistent with well-established "hard look" concept under SEQRA jurisprudence, the reasonable worst case development expected from the entire Marcellus Shale within New York State needs to be defined, and its potential impacts disclosed. The potential impacts to be evaluated include, *inter alia*:

- How much methane and natural gas would be leaking from all wells and what would the effect be on greenhouse gas emissions;
  - How much water (surface and groundwater) will have to be withdrawn and used in the fracturing process;
  - What type and how many wastewater treatment facilities will be required to treat the fracturing fluid, its constituents, and produced water from the well after development;
  - Where will these facilities be located, (i.e. at the wellhead or elsewhere);
  - How much gas can be expected to be extracted and what type of gas transmission and treatment facilities would be needed; and
  - What type of new developments, new roads, and population patterns can be expected?
4. The SGEIS process should be used to consider whether there are certain areas (e.g., the New York City and other watersheds, lands under conservation easement purchased with public funds for the

purpose of natural resource protection, and other critical ecological areas) that must be placed permanently off-limits to drilling because the risks of harming the drinking water supply or other natural resources are too great. In addition, NYS DEC should consider whether there are geographic areas in which the maximum number of wells and/or maximum amount of water withdrawn should be capped.

5. Pipelines and gas treatment facilities are integral to development of the Marcellus Shale and must be disclosed, even if the Public Service Commission (PSC) and not NYS DEC has permitting authority. By not analyzing the ancillary facilities in the SGEIS, the Department would be segmenting the project and not taking into account the full potential impacts of development of the Marcellus Shale. A natural gas well by itself is not complete; it is meaningless without the facilities to transport the gas to where it is needed and where it can be treated for sale. To avoid segmentation, the combined impacts of all elements necessary for development of natural gas from the Marcellus Shale must be considered in the SGEIS.

Further, the rationale that PSC, not NYS DEC has permitting authority is not valid. An agency normally analyzes all of the potential impacts of a proposed development including those over which it has no statutory or regulatory authority. For environmental impact statements evaluating proposed changes to roadways, for example, the New York State Department of Transportation (NYS DOT) regularly analyzes the impacts of bridges over waterways, even though the ultimate permitting authority rests with NYS DEC and the Corps of Engineers.

6. While the approach of relying on the 1992 Final Generic Environmental Impact Statement (FGEIS) to the extent possible may be valid, not all analyses in FGEIS remain valid. Before a conclusion can be made to rely on the prior analysis in the FGEIS, each technical area needs to be examined in detail to determine if the analysis is still valid after several decades. It is our position that a number of the analyses in the 1992 FGEIS are not sufficiently current and up-to-date to be relied upon, and instead these technical areas must be re-analyzed using today's standards and methods.

As an example, ambient air quality regulations have changed since 1992, the number of and reasons for non-attainment areas have changed, and modeling techniques have improved. The FGEIS did not model potential short term noise impacts, but instead relied on some then current federal Environmental Protection Agency (EPA) noise parameters. Since that time, NYS DEC has developed its own noise impact criteria and methods of analysis. In addition, the effects on land use and community character were not rigorously analyzed in the FGEIS. As a result, the setbacks adopted by the Department were not based on analysis, but rather on "rules of thumb." Impacts on rare and endangered species and habitats were also insufficiently considered in the FGEIS. Neither greenhouse gas emissions nor Environmental Justice were analyzed in 1992. Each of these deficiencies must be addressed in the SGEIS.

The Draft Scope of Work must be modified to specify which of the FGEIS analyses will be relied upon and which will be updated in the SGEIS to reflect today's methodologies and regulations.

Similarly, any reliance on the conclusions from the FGEIS as to when NYS DEC will require an applicant for a well drilling permit to prepare an individual EIS must be revisited in the context of drilling in the Marcellus Shale and fresh determinations in this regard made.

7. The Draft Scope of Work does not identify the specific methodologies to be used in each of the analysis areas, which are discussed separately below. To simply state that a particular technical area will be examined does not constitute a scope of work. The Scope of Work needs to specify which particular technical areas will be analyzed and *how* they will be analyzed.

Among other things, the study area needs to be defined functionally, depending on the type of impact analyzed. As an example, for surface water impacts of drilling, the hydrologic unit code 14 or 11 (i.e., sub-watershed) would define an appropriate geographic area of analysis. Likewise, the models

proposed to be used to evaluate potential impacts (e.g., for air quality and noise) must be specified and the key parameters selected.

Moreover, the methodologies need to be specified for each of the three levels of analysis discussed above; local, regional, and cumulative. The appropriate methodologies to be employed will vary depending on the level of analysis.

8. Certain critical impact categories are excluded from mention altogether in the Draft Scope of Work. For example, there is no indication that the SGEIS will analyze the potential for significant adverse traffic impacts from additional truck traffic that will necessarily be associated with the proposed action. Other important analyses excluded from the Draft Scope of Work include, but are not limited to, vibration, solid hazardous materials, and greenhouse gas emissions (which, as discussed below, cannot properly be delayed due to the pendency of a guidance document).
9. The Division of Mineral Resources should demonstrate that it has consulted with all other divisions of the NYS DEC with relevant technical expertise (e.g., the Divisions of Water; Air Resources; Fish, Wildlife and Marine Resources; Forest Protection; Lands and Forests; Solid and Hazardous Materials; Climate Change; and Environmental Justice) in preparing, conducting and reviewing the analyses in the SGEIS. In addition, where NYS DEC may not have the needed technical expertise, such as public health assessment, the Division of Mineral Resources should demonstrate that it has consulted other agencies, such as New York State Department of Health, for the appropriate methodologies to be used. After the analyses are completed, the divisions or agencies should review and approve the results and any proposed mitigation measures.
10. All regulatory and permitting requirements by NYS DEC and any other agency for the proposed action (including aspects ancillary to the gas drilling wells themselves) must be identified and the associated impacts considered in the SGEIS. In terms of the Regulatory Program, these would include identifying thresholds in each technical area where exceedances could lead to significant adverse impacts, and mitigation measures and best management practices are needed to prevent the potential for significant adverse impacts. Then, the SGEIS should state when certain best management practices must be implemented when a threshold has been exceeded.
11. The SGEIS must analyze additional alternatives beyond no development of Marcellus Shale natural gas. At least three additional alternatives need to be analyzed. First, the SGEIS must evaluate the alternative of a different permitting structure or approach. NYS DEC currently issues permits on a well-by-well basis whereby a company submits separate applications for wells even in close proximity to each other. A programmatic basis offers an alternative under which a permit application would be submitted for all wells that a company proposes to drill within a specific geographic unit, such as a watershed or an agricultural area. Impacts of the unit-wide drilling would be subject to a single, separate environmental analysis. Under the programmatic permitting process the wells need not be under construction at the same time to be considered one project. As an example, suppose a company has two rigs and has the technical and financial capacity to develop 20 wells in a 50 square mile watershed over a two year period. The company would be required to analyze a project consisting of all 20 wells rather than filling out individual environmental assessment forms for each of those wells as is the current practice, which is likely to understate the potential cumulative impacts of the overall development scenario contemplated by the applicant. In the event an applicant does not disclose future planned development or if additional development becomes possible in the future, the applicant would be required to analyze the impacts of all wells that it has drilled and proposes to drill in the geographic area. The SGEIS should analyze this alternative permitting approach.

The second alternative that should be evaluated is the development of a regional or state-wide Natural Gas Development Plan, similar to the state-wide Energy Plan before additional well development is allowed. The Natural Gas Development Plan would establish the objectives of natural gas development in New York State and lay out goals for achieving the objectives. Then a permitting

approach would be developed to accommodate the goals and objectives of the Plan. This permitting approach would be subjected to an environmental impact analysis.

The third alternative that should be analyzed would be not developing natural gas in certain areas of particular ecological and/or human health importance (such as a watershed or primary aquifer, wetlands, floodplains and adjacent riparian areas, lands under conservation easement purchased with public funds for the purpose of natural resources protection, etc.) and/or capping development in these or other areas inappropriate for mass-scale natural gas development. This limited development alternative would be analyzed and compared to the base alternative of natural gas development throughout the Marcellus Shale Formation in New York State.

These three additional alternatives would provide the decision-makers with an appropriate context in which to select the gas development approach for New York State with the fewest unavoidable significant adverse impacts to the environmental and public health.

12. Because of these and the specific deficiencies in the Draft Scope of Work set forth below, we respectfully request that NYS DEC issue a revised Draft Scope of Work for public comment prior to commencing work on the SGEIS. To do otherwise would deprive the public of the opportunity to review and comment on, *inter alia*, the proper range of proposed analyses and the particular methodologies proposed to be employed for the SGEIS.

## **B. COMMENTS BY TECHNICAL AREAS**

### **GENERAL**

On the NYS DEC web site, pages 22, 43 and 44 of the FGEIS are missing, and page 5-10 of the DGEIS is missing. In addition, page 11 appears twice in the FGEIS.

### **PROJECT DESCRIPTION**

The description of the proposed action is overly vague—it needs to describe exactly which formations will be subject to analysis in the SGEIS and subsequently to the Department's Regulatory Program and any regulatory revisions that may be proposed in the SGEIS. The SGEIS should explain how other low permeability formations being examined differ (in geographic extent, depth, geologic characteristics, etc.) from the Marcellus Shale formation, as well as what different exploration, drilling, completion, and stimulation techniques may be employed for gas development in the various formations. To provide an adequate delineation of the proposed action, the SGEIS needs to include mapping of the formations being examined. The description must also show the stratigraphic column above the formations. The description must include all existing wells, gas pipeline and treatment facilities. State-wide mapping of the resources on such an extensive program as this can only be done using a Geographic Information System (GIS). Traditional mapping is not sufficient. All regulatory and permitting requirements by NYS DEC and/or any other agency for the gas drilling program must be identified and impacts considered in the SGEIS.

In addition, as discussed above, the proposed action must be described as consisting of the overall permitting program for gas drilling in the Marcellus Shale and other low permeability reservoirs (and all related development), as opposed to a series of discrete, independent drilling projects.

### **SURFACE WATER**

#### ***WITHDRAWAL***

The very large volumes of water needed for the hydraulic fracturing proposed for the Marcellus Shale are described by NYS DEC as being a primary motivation for preparing a supplement to the 1992 FGEIS. Fracturing the Marcellus shale with a horizontal well can require 5,000,000 to 9,000,000 gallons, which is more than 100 times greater than 80,000 gallons currently used for vertical wells. The potential impacts associated with this water use are commensurately much greater, especially considered cumulatively, and

the SGEIS must consider these increased impacts adequately. Indeed, this quantity of water is as large as the discharge of some streams.

The SGEIS should establish river flow conditions that must be met before any diversions are allowed. The suggestion in the Draft Scope of Work that NYS DEC will use the 10-year 7-day low flow as the limit would allow diversions during critical drought occurrences and should be reconsidered. Considerations in setting an appropriate limit include aquatic habitat and water quality. The analysis should establish a flow rate, based on return interval, during which diversions could be made without significantly diminishing aquatic habitat or allowing the concentration of contaminants to increase and thereby resulting degradation of the streams.

Based on the volume of water required from small streams and watershed tributaries, the SGEIS must consider placing restrictions on the rates and time periods of withdrawal, as well as total withdrawal volume, considering seasonal effects and impacts during periods of low flow. The Scope of Work must show how the Department will develop these restrictions and how the water management plan for each regional analysis will be framed.

NYS DEC must consider the potential for inter-basin transfers of water if withdrawals occur in one basin but are treated and disposed of in another location. NYS DEC may not rely solely on the Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC) for assessment and mitigation of impacts within the Susquehanna and Delaware River Basins, but rather must independently analyze potential impacts and disclose them in the SGEIS. The SGEIS should disclose the percentage of the Marcellus Shale that is outside those watersheds and thus not subject to the Commissions' authority. In addition, the Draft Scope of Work must describe in detail precisely how the potential significant adverse impacts to these watersheds, as well as the New York City watershed, from withdrawals will be analyzed, and appropriate mitigation identified.

### *QUALITY*

In addition to the potential significant adverse impacts associated with surface water withdrawal, the Scope of Work must disclose how the potential impacts to surface water quality will be analyzed. The models that will be used must be named, and the main water quality analysis parameters described. To ensure that the proposed analyses in the Scope of Work benefit from the full range of NYS DEC's expertise, we suggest that the Division of Mineral Resources coordinate and consult closely with the Division of Water.

## **GROUNDWATER**

### *WITHDRAWAL*

The Draft Scope of Work focuses on surface water withdrawals, and no analysis of groundwater withdrawals is proposed. Because a company could propose to obtain the necessary water for hydraulic fracturing from groundwater, the potential significant adverse impacts of groundwater withdrawal must also be analyzed. Five to nine million gallons to fracture a horizontal well is a very large volume of groundwater, and it would be withdrawn in a short time period. Such withdrawal could adversely affect individual drinking water wells. Moreover, NYS DEC should analyze the potential impacts to groundwater at all levels of production because the amounts of water needed represent a substantial draw on a local aquifer's water budget and cumulatively could represent a significant impact on a region.

The SGEIS should present a generic analysis of commonly-used aquifers within the Marcellus Shale region to determine allowable diversion rates, possibly as a function of distance from important features which include other wells and spring/wetland discharge points. This could include a generic modeling effort using common aquifer properties, transmissivity, and storage coefficients, to determine the potential effects of allowing certain rates of diversion. The results of the generic modeling would be used to establish setbacks from existing drinking water wells and springs. If the proposed natural gas wells are beyond the setbacks, a site specific modeling effort would not be required as part of the permit



application. If the proposed natural gas wells are within the setback limits, then a site specific model would be required as part of the permit application. This analysis should also be used to limit the amounts withdrawn within a given area of interest over certain time periods based on the potential effects on nearby well owners, wetlands, and spring/stream flows.

The Scope of Work needs to specify a groundwater model or analytical methodology that will be used, including the conceptualization for flow, the connections with surface water features, and a range of potential hydrologic parameters, and it must identify how a generic groundwater analysis will be done for a large volume groundwater withdrawal for fracturing fluid. The outputs of the model(s) need to be listed, and at a minimum should include the predicted drawdown and the changes that may be caused to surface water sources. Full details of the impact analysis must be contained in the Scope of Work. The effects on drinking water wells within the same aquifer need to be included in the analysis. Finally, since this is an SGEIS, the analysis will likely be generic, but the Scope of Work must explain how the generic results will be applied to specific permit applications for groundwater withdrawal to specific geographic areas, as well as on a cumulative statewide basis, as discussed under the Overarching Comments above. The explanation needs to include how a water management plan for an area would be developed and implemented.

### *QUALITY*

Although the Draft Scope of Work correctly states that the Marcellus Shale is at great depth in certain locations, it is not uniform in depth throughout New York State. Thus, the extraction of natural gas could potentially occur in locations where it is close to the surface. If these regions of shallow shale will not be developed, the Scope of Work should state as much and the SGEIS should set these areas off limits.

Marcellus shale natural gas development could contaminate groundwater in several ways. There could be leaks from the lined pits, drilling operations, faulty well construction, or from the wells due to high pressures developed during hydraulic fracturing or gas development. The hydraulic fracturing process could change the properties of the shale over extensive areas due to the scale of the development. It could also intersect with natural faults or fractures and expand them substantially. These changes could allow the migration of contaminants from the shale to overlying formations.

Hydraulic fracturing creates vertical fractures in the shale which could extend to the edge of the formation. This fracturing could substantially change the hydrogeologic properties of the formation; industry literature indicates the permeability increases many orders of magnitude after fracturing, although on average the shale continues to have low conductivity. Although the industry uses hydraulic fracturing simulation models to design their fracturing plans, it is not clear that the models have been validated with regard to hydrogeology. The properties of shale are very heterogeneous and could include unknown fault/fractures which would cause the fracturing results to vary, potentially allowing new or expanded fractures to span the entire shale thickness. The hydrogeologic changes are sufficient to increase the interchange of fluids, including background groundwater and introduced hydraulic fracturing fluid, between the shale and adjacent formations which could contaminate the groundwater in those formations.

The SGEIS should analyze these potential changes. It should include a survey of any literature that discusses the hydrogeology and validates the fracturing models. The SGEIS should analyze how changing shale properties would affect groundwater flow and contaminant transport through the shale and surrounding formations. The potential for natural faults and fractures, which could be enhanced by the fracturing, should be considered. The SGEIS should include information on Marcellus Shale rock mechanics and subsurface reservoir pressure. The SGEIS should provide data to support whether fracture stimulations in horizontal wells would induce vertical or horizontal fractures. More specifically, the SGEIS should provide geophysical data describing the minimum principal stress for the gas-prone section of the Marcellus Shale and estimate the maximum predicted vertical fracture possible. The SGEIS should provide data on the maximum vertical fracture propagation height that can be created using the highest volume, highest pressure fracture treatment planned for the Marcellus Shale. Vertical fracture propagation

data should be based on actual field performance and technically valid engineering studies. The SGEIS should contain information on regional rock mechanics. The SGEIS should establish criteria for planning and executing fracture treatments to ensure ground water protection.

The analysis should include a regional groundwater flow and transport model for the shale and aquifers above and adjacent to the shale. The analysis would consider existing, pre-fractured hydrologic properties and changed conditions which would include new hydraulic conductivity values for the shale resulting from the fracturing process. The analysis should include reasonable estimates of post-fractured properties and the heterogeneities inherent in the shale. The Scope of Work needs to specify how this modeling will be completed, including which models and data will be used to establish parameters for both the flow and transport models. The Scope of Work should describe the conceptual model for groundwater flow through the aquifers at present and how, or whether, the increased conductivity in the shale would change the flow. The conceptual model would also describe the shale and aquifer properties which would affect the movement of contaminants. The analysis needs to be done for different depths below the ground surface and not just assume that the development would only occur where the Marcellus Shale is deep and the intervening rock formations would serve to contain any fluids.

Another way that contamination could occur is through the well bore due to high pressure fracturing or through gas development. Return water from fracturing process will follow the path of least resistance, which might appear to be out the well bore. However, the high volume of water being used means the operator must seal the well and collect the return flow, a process which may result in pressures, and even water hammer effects, that exceed the capacity of the well bore to contain them or which may find faulty joints through which fluids may leak.

Contamination may also occur due to spills and leaks of returning hydraulic fracturing fluid and produced water. If this water is stored in pits, lined pits could leak if improperly constructed or overflow if the volume is undersized. This could happen especially due to produced water volumes significantly exceeding the amount expected.

The Draft Scope of Work indicated there has been no contamination due to previous gas development, but there does not appear to have been monitoring well data collected to verify these claims. If such data exist, the SGEIS should present it. Otherwise, the SGEIS should discuss a plan for monitoring for contamination, including baseline data collection before the development of a project, which as defined above should include a larger area than just a single well. This should include monitoring for leakage from wells, pits, and the shale, if it is sufficiently shallow to contaminate aquifers. The SGEIS should also include mitigation plans for cleaning up when contamination occurs.

#### **WASTEWATER TREATMENT AND DISPOSAL**

The treatment and disposal of spent fluids and produced waters is one of the most important, but problematic analysis that must be completed in the SGEIS. We suggest close coordination and consultation with the Division of Water, which is the Division within the Department with the greatest knowledge of wastewater treatment techniques. The Scope of Work must show how NYS DEC will determine all constituents and their concentrations in the fluid that is extracted from the well to ensure that there is adequate analysis of both what is in the drilling and fracturing fluids and how the fluids will react chemically with substances in the different formations they will pass through, such as normally occurring radioactive materials (NORM). In addition to identifying the chemical constituents and their concentrations, the Scope of Work must explain how the volume of fluids, including formation produced water, will be calculated. After the analysis of how the exact nature and volumes of the spent fluids is performed, the types of treatment processes that will be analyzed need to be listed. How the effectiveness of the potential treatment processes will be analyzed needs to be explained in the Scope of Work.

#### **EROSION AND SEDIMENT CONTROL**

The Scope of Work must address how best management practices will be developed and assessed for erosion and sediment control. Erosion from seismic testing, construction of well pads and roads, and

drilling activities can be substantial, especially on slopes and can lead to significant adverse impacts on sensitive areas, such as wetlands and unique habitats. Methodologies to develop restrictions, protections, and setbacks must be explained in the Scope of Work. This includes not only physical measures, but also institutional measures. Consideration should be given to whether oversight for erosion and sedimentation should reside in the Division of Water rather than Division of Mineral Resources. In addition, consideration should be given to developing and adopting a State Pollutant Discharge Elimination System (SPDES) type general permit for erosion and sedimentation as is being required in Pennsylvania.

## AIR QUALITY

The Draft Scope of Work groups noise, visual, and air quality impacts as items having the potential for only local impacts. However, the development of natural gas from the Marcellus Shale would result in emissions of pollutants of concern on both local and regional scales. Therefore, SGEIS needs to have a stand-alone chapter to address all aspects of potential air quality impacts, in addition to separate chapters analyzing the potential for significant adverse visual, traffic, and noise impacts.

The following comments do not suggest explicit methodologies, but rather analyses that need to be defined and then completed for the SGEIS. The Division of Mineral Resources should consult with the Division of Air Resources to carefully formulate the specific methodologies to be presented in the Scope of Work. However, it is expected that standard and accepted models will be used. For example, the air pollutant dispersion modeling for drilling and construction equipment emissions should use the latest version of the EPA/AMS' AERMOD model and the dispersion modeling for mobile source emission should use the latest version of CAL3QHC.

Section 4.1.3 of the Draft Scope of Work states that "*The DSGEIS will examine whether any anticipated activity at Marcellus or other shale well sites could result in an air quality impact that is not discussed in the GEIS.*" However, no details or methodology for making this examination are included. Since the FGEIS did not address any air quality issues in a quantitative manner, and since much knowledge, and information, new modeling technology has accumulated, and new regulations have been promulgated since 1992 to satisfy SEQRA's requirements, NYS DEC must quantify all potential air quality impacts of the proposed action at the local, regional, and statewide levels. Background air pollution levels and nonattainment designations have changed as well. The SGEIS must discuss options to minimize emissions and avoid or mitigate any identified significant adverse air quality impacts.

Issues to be addressed explicitly include, but are not limited to the following:

- a) Describe the air permit review and approval process that will be used to approve site-specific air pollution sources for the Proposed Action. Please specify the regulatory framework and the air permit approvals required from each level of government (local, state and federal). This information will be crucial to understanding the future review options in cases where additional detailed analysis of potential impacts may be necessary.
- b) Baseline air quality data and meteorological data to be used for analysis should be identified in detail. Although recent detailed data is available in some areas, the Proposed Action encompasses large areas of New York State in which sufficient data may be lacking. In such instances, the assumptions and procedures proposed must be discussed in detail.
- c) Reasonable worst-case scenarios should be formulated to represent the various potential construction and operational scenarios. These should include microscale dispersion modeling of both single-locations and multiple adjacent locations scenarios (i.e., at the local and regional levels) in development and production situations. The dispersion modeling of criteria pollutants and relevant hazardous air pollutants (HAPs) is needed to ensure that National Ambient Air Quality Standards (NAAQS), for criteria pollutants, and annual guideline and short-term guideline concentrations (AGC/SGC), for HAPs, will not be exceeded or that existing exceedances will not be exacerbated.

This analysis should ensure that local exceedances of particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), carbon dioxide (CO), sulfur dioxide (SO<sub>2</sub>), and nitrogen dioxide (NO<sub>2</sub>) NAAQS and of the AGC/SGCs defined in DAR-1 for HAPs commonly found in natural gas (e.g. hydrogen sulfides, benzene, ethyl benzene, toluene, and xylene) will not be exceeded. The modeling must demonstrate that violations would not occur as a result of construction and operations on short-term and annual time scales. Air quality modeling done for construction sites that use smaller equipment than proposed to be used at gas well drilling sites have predicted significant increases of the concentration of these pollutants.

If the modeling does reveal potential violations of air quality standards or guidelines, mitigation measures to prevent or minimize these violations must be developed. Based on this generic modeling of single and multiple sites, the results will identify when site-specific modeling is need for sites near residential and publically accessible areas, and the procedures for these future analyses.

For example, dispersion analyses of a single well pad could be used to determine the distance from a site within which significant air quality impacts could be expected. Mitigation could then be identified, which would be required in cases where residential or other publicly accessible land uses are located within that distance from the well pad, or, alternatively, a procedure and approval process could be identified for such sites. A minimum distance between well pads needs to be determined, below which further mitigation or cumulative analysis of impacts from the multiple sites would be required.

It is expected that HAPs analyses would mostly focus on the potential impacts of leakage, unless other potential project sources are identified.

NYS DEC reports that in 2007 nearly half of operational wells were located in Chautauqua County, which equates to approximately three producing wells per square mile in an ozone nonattainment area. NYS DEC should use similar information to determine the reasonable worst-case scenarios for the cumulative air pollution impact, as well as focusing on areas with higher population density, such as the Capital District, which is also located in an ozone nonattainment area. The basic assumptions for these scenarios must be defined in the Scope of Work.

- d) The SGEIS should disclose the reasonable-worst-case ozone precursor emissions inventory expected in each ozone nonattainment area, and demonstrate that these emissions would not result in new exceedances of the ozone NAAQS or exacerbate current exceedances, or, alternatively, identify the procedure and enforcement mechanism for future additional analysis (e.g. within the permitting process or additional, non-generic EIS), or identify offsets for the emissions. NYS DEC needs to make this demonstration in the context of the State Implementation Plans (SIP) in each region, and disclose the potential impact of such emissions in ozone nonattainment areas where a SIP does not currently exist. The requirements and procedures of this analysis should be developed in close consultation with NYS DEC's Department of Air Resources and outlined in detail in the Scope of Work.

This analysis needs to include, but not be limited to, emissions associated with construction and operations, including mobile sources (e.g., construction, delivery, and gas transport in all transportation modes), nonroad sources (e.g., construction, on-site equipment), stationary sources (e.g., power generation, backup generators, compressors, heaters, boilers, etc), and flaring, hydrocarbon leakage, and other fugitive sources (e.g., tank venting, road dust, incinerators). Drilling the wellbore is only one step in the process of developing a gas reservoir—cumulative and regional analyses should include all exploration activities to locate potential gas reservoirs

(e.g., seismic and geologic and geophysical activities), exploratory drilling, production drilling, and transportation and treatment systems required to bring the gas to market.

e) Actions for reducing potential emissions need to be considered and discussed, including, but not limited to:

- Use of more fuel-efficient power generators;
- Use of more fuel efficient mobile sources;
- Minimization of flaring and use of more efficient flare systems;
- Use of lower polluting fuels when possible (e.g. low sulfur diesel, natural gas);
- Use of vapor control systems;
- Use of high destruction efficiency incineration systems;
- Adoption of fugitive dust control methods; and
- Employment of leak detection and repair programs to reduce fugitive emissions.

The SGEIS should identify where New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAPs) apply.

All analyses should take into account the following:

- The increased power requirements, and corresponding increase of air pollution emissions from drilling horizontal wells and stimulating the wellbores with high volume, higher pressure fracture stimulation techniques;
- The amount of flaring necessary to test the wells. Please consider methods and mitigation measures to limit the amount of flaring to reduce economic waste, natural resource waste, and air pollution. Please consider if this gas can be flowed back into an existing pipeline to avoid flaring, or if alternative testing methods could be considered to limit the volume of gas flared (e.g., drill stem testing).
- Compositional analysis data for the following pollution sources:
  - i. Formation gas from the Marcellus Shale;
  - ii. Formation gas from other low permeability gas reservoirs;
  - iii. Fuel sources (natural gas, diesel, gasoline, etc.); and
  - iv. All sources of gas venting.

## **GREENHOUSE GASES**

On September 17, 2008, prior to release of the Draft Scope of Work, NYS DEC released a preliminary draft technical guidance for NYS DEC projects regarding the inclusion of greenhouse gas (GHG) emissions, energy use, energy conservation, and climate change in EISs under SEQRA for informal review by stakeholders. In this document, NYS DEC has recognized the importance of climate change impacts and that SEQRA can be used to identify and assess climate change impacts, and the steps to minimize the emissions of greenhouse gases that cause climate change.

Although the preliminary draft technical guidance specifically addresses more common project types in New York such as development, stationary sources requiring permits, and solid waste facilities, the guidance also provides a general framework for analysis, and identifies fuel producing projects explicitly as projects that may be required to analyze (either qualitatively or quantitatively) the emissions that will result from the use of the fuels produced. NYS DEC does not intend to publish guidance for every specific type of project, and that projects such as the Marcellus Shale development would likely require further definition of the precise methodology for analysis in the scoping of the project even after the final publication of this guidance.

Under these circumstances, NYS DEC cannot defer an assessment of the potential GHG emissions from development of the Marcellus Shale until the issuance of the final guidance on GHG analysis. Rather SEQRA requires that proposed actions—large fossil fuel-producing projects, such as the proposed

action—disclose potential GHG emissions and identify measures to eliminate or reduce such emissions. The current lack of a formally adopted guidance for this type of project does not preclude defining such a methodology in the scope of the Proposed Action, nor does it negate the current requirement under SEQRA for such analysis and disclosure.

The Office of Climate Change should be consulted on the exact methodology for the GHG analysis, which needs to include the following:

1. A discussion of the project in the context of New York State's energy and GHG goals.
2. A quantified analysis of upstream and direct GHG emissions associated with construction and operations. This analysis would include mobile sources, on-site engines used for construction and operations, embodied emissions from concrete and steel, flaring, leakage, and upstream emissions associated with the use of all fuels (mobile and stationary).
3. A discussion of deforestation (e.g., for seismic testing, well pad, road, and pipeline construction), and the impacts quantified if significant.
4. A qualitative discussion addressing emissions associated with the use of the natural gas produced, including all of the above emissions resulting from the production process and the use of the fuel itself as compared with other fuels.
5. Disclosure of the extent to which the production of natural gas within New York State would impact the development and use of renewable fuels and electric power.
6. An outline of all potential measures for reducing GHG emissions from this type of project, which quantifies, where possible, the benefits from such measures that are not included in the project (and quantified in the previous sections). The discussion should explain why any such measures are not being included.
7. Commitments to practicable measures that reduce potential emissions and hydrocarbon leakage should be outlined in the SGEIS.

## **TRAFFIC**

The drilling process involves using a large number of trucks to transport water for fracturing, drilling equipment, drilling and fracturing fluids, production equipment, and workers on local, secondary roads. These are two way trips bringing the material and people to and from the site, and they occur over a period of weeks, if not months at a time. In the event that a well is refractured, moreover, there is the potential for such trips to occur on a repeated basis. The Draft Scope of Work does not propose to analyze potential traffic impacts. We believe a fully quantified analysis of development of multiple wells from one well pad, as well as multiple well pads within a geographic area, is necessary to disclose both the potential traffic impacts, potential air quality impacts from dust, and potential damage to local roads. The number of daily trips for the development needs to be calculated, and the potential impacts analyzed using methodologies from the Highway Capacity Manual. Methods to minimize truck and vehicle trips, while not increasing the weight of the trucks, need to be developed and enforcement measures proposed. Alternatives to truck traffic, such as pipelines, centralized operations facilities, and remote-controlled equipment, should also be analyzed. The likelihood of damage to local roads, which are often gravel and oil or dirt, needs to be disclosed so that the probable cost and methods of repair can be estimated.

## **NATURAL RESOURCES**

We suggest that the Division of Fish, Wildlife, and Marine Resources, Division of Land and Forests, and Division of Water be consulted in developing the Scope of Work for natural resources. The natural resources assessment must take into account the impacts of developing multiple well sites in a local area and fragmenting the ecological communities. The potential for impacts from cutting trails to allow seismic testing is not addressed in the Draft Scope of Work and must be included in the SGEIS. The

potential for fragmentation is caused not only by the well sites themselves, but also by trails for seismic testing, access roadways, pipelines, and other appurtenant development.

The use of the Habitat Databank for determining locations of rare and endangered species is insufficient because the Databank covers public land whereas most drilling is proposed for private land. Additional data must be collected and critical habitats mapped to assess the potential impacts to endangered, rare, or threatened species. This data collection and mapping cannot be deferred to the permitting process, as it is an issue of regional significance, and thus would not be captured in individual permit applications under the current Regulatory Program. The significant disruption to migration patterns in the west (e.g., Wyoming, Montana, and Colorado) should be considered in evaluating the potential for similar impacts (albeit to different species using different types of habitat) in New York State.

The analysis of potential natural resources impacts from water withdrawals must be based on ecological and biological indicators beyond simply trout, and must include both flora and fauna. The particular indicators that will be evaluated must be specified. Consideration should be given to the potential for invasive species to take advantage of trails for seismic testing, new roadways and pipeline right-of-ways. The potential for new forest fringe to be created in lieu of interior forest should be evaluated. Potential impacts to watershed, wetlands as well as regulated floodplains and adjacent riparian areas as defined by soils must be carefully evaluated. Any proposed setbacks from wetlands should take slopes into consideration. In addition, as discussed above, consideration should be given to placing such resources off-limits to drilling if the potential impacts are too significant to be effectively mitigated or avoided.

Other potential impacts to wildlife include noise, light, and traffic.

The assessment of impacts on natural resources requires site-specific ecological assessments at the location of well drilling and in the immediately surrounding landscape with the potential to be negatively affected. Therefore, the SGEIS must necessarily stipulate that a range of ecological impacts to flora and fauna be inventoried and assessed for each application. Consideration of generic impacts of drilling in the Marcellus Shale, as conceived in the proposed action, must be limited to those that can be assessed state- or region-wide, such as cumulative forest loss or regional air quality. This leaves the assessment of impacts to a great number of vitally important ecological resources for subsequent SEQRA review on a site-specific basis. These include, but are not limited to, impacts to specific terrestrial or aquatic plants or animals, impacts to critical wildlife habitat, impacts to rare ecological communities, and habitat fragmentation impacts considered at the local scale.

## **NOISE**

Since preparation of the 1992 FGEIS, the Department has developed a guidance document for assessing noise impacts, "Assessing and Mitigating Noise Impacts," DEP-00-1. This document should be the basis for the noise impact assessment. Experience on construction sites using equipment smaller and quieter than drilling equipment has shown that noise levels from construction do exceed the impact levels in DEP-00-1. The Scope of Work must disclose the noise model that will be used in the analysis and the types and numbers of equipment that will be modeled. The preferred model for the construction equipment sources is Cadna A, which is based on ISO 9613.2 acoustic propagation standards. The preferred model for mobile sources is the Federal Highway Administration's Traffic Noise Model (TNM) version 2.5. In the SGEIS, the distance from the drilling sites and compressor stations to where noise levels are below the impact levels must be disclosed. Mitigation measures, including setbacks between sensitive receptors and drilling sites or compressor stations, need to be developed.

If regulatory control of seismic exploration is part of the Proposed Actions, the potential impacts of noise on people and fauna must be discussed.

## **LAND USE AND COMMUNITY CHARACTER**

Statements, such as "*However, in heavily populated areas and/or areas frequented by children, the Department can require that access to the site be restricted. For example, fencing around a pump jack may be required for a well on school grounds.*" (FGEIS, page 16-10) do not constitute an analysis of

potential land use impacts. The drilling process, while disruptive, is temporary, but the operational aspects last for decades. The potential impacts must be analyzed so that guidelines for the placement of wells can be developed. As noted above, placement of a well close to or on school grounds would constitute a significant impact to land use. The Scope of Work must present a methodology for assessing land use impacts and a methodology for developing guidelines for the placement of wells in any area frequently used by people.

The assessment of impacts on community character is more subtle. Something as small as a change in the physical construction of a road, such as replacing a gravel and oil road with an asphalt road, can result in a change in community character. The number and type of vehicles using the road can change the visual aspects of the road as well as other factors that can affect community character. The introduction of large numbers of workers can cause changes in the community character. Gas wells and gathering pipelines would have a permanent change in the local landscape and visual characteristics. Concentrations of well pads within or near a community clearly has the potential to significantly alter (and adversely affect) the character of a community. The Scope of Work must describe how development of gas in the Marcellus Shale will be assessed for the full range of potential significant adverse impacts on community character. Since the Marcellus Shale Formation is found in agricultural, rural, suburban, and urban communities, the Scope of Work must include methodologies for each of these environments.

### **LAND RECLAMATION**

At the completion of seismic testing and/or well operation, the land must be reclaimed and restored to its original condition. The Scope of Work must address how best management practices will be developed and assessed. Allowing the drilling site to remain in its disturbed condition can lead to erosion and sedimentation. In areas of forests, slopes, wetlands and unique habitats, the reclamation of the land is especially critical. Methodologies to develop restrictions, protections, and setbacks must be explained in the Scope of Work. If open pit storage of fluids is being proposed, the SGEIS should determine the best practices for pit restoration, e.g., revegetation, stormwater management, habitat restoration. In determining the appropriate mitigation for identified significant adverse impacts of land clearing, the function of pre-clearing habitat and its replacement must be considered.

### **HISTORIC RESOURCES**

This is a technical area where existing coordination with Office of Parks, Recreation, and Historic Preservation needs to be explained, and any improvements to the Regulatory Program, if necessary, proposed.

### **ARCHAEOLOGICALLY SENSITIVE AREAS**

This is a technical area where existing coordination with Office of Parks, Recreation, and Historic Preservation needs to be explained, and any improvements to the Regulatory Program, if necessary, proposed.

### **CONTAMINATED MATERIALS**

The drilling and hydraulic fracturing processes generate large volumes of liquid and solid wastes that could qualify as hazardous wastes. These include spent fracturing fluids, drill muds and cuttings, as well as sludge and solids from pits and tanks. The SGEIS must include an estimate of the volumes and types of these wastes on the three levels of analysis—discussed above—local, regional, and cumulative. Specifically, NYS DEC should consider whether its categorical exclusion of “drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of .....natural gas” from the regulatory definition of “hazardous waste” (6 NYCRR § 371.1(e)(2)(v)), and its exclusion of “gas drilling, production, and treatment wastes” from the definition of “industrial waste” (6 NYCRR § 360-1.2(b)(88)) are warranted, given the results of testing. Any necessary changes to the Regulatory Program to ensure that such wastes are properly tested, handled, treated, and disposed of must be evaluated. These wastes must be tested to determine if they meet the statutory definition of hazardous



waste or industrial waste. Likewise if the fracturing fluids are exposed to NORM, the level of radioactivity needs to be determined. The ability to handle the volumes and types of these wastes appropriately must be considered. A solid waste handling plan should be developed as part of the environmental review process.

### **EMERGENCY RESPONSE**

Accidents ranging from minor injuries to blowouts of wells can occur in the development of the Marcellus Shale. Local first responders will be first on the site to deal with these situations. The Scope of Work must define a methodology to determine if local municipalities have the resources to be first responders in both small and large emergency situations. All potential community services that may be required in any aspect of the process (including for pipelines, etc.) must be considered. If certain areas are found not to have the capabilities to adequately respond to potential emergency situations, mitigation measures must be developed to address the lack of emergency response capability.

### **PUBLIC HEALTH**

We suggest that the Department consult with New York State Department of Health to develop a comprehensive scope of work to define, analyze and develop mitigation for potential public health impacts from the drilling, producing, transporting, and treating natural gas. The analysis must be multi-media and include all possible sources of harmful materials. Air emissions, water, and soil are all media through which deleterious materials may be dispersed. The sources include spills, breaks, leaks, hydrogen sulfide escaping from the formation, diesel emissions and related vehicular traffic from the drilling, and evaporation of the fracturing fluids, both before and after the fracturing process. In addition, noise and vibration may have health impacts that should be examined.

### **ENVIRONMENTAL JUSTICE**

The Scope of Work should commit to using GIS to map all environmental justice census blocks in the Marcellus Shale area and overlay the location of existing wells. The potential for an environmental justice community to be over-burdened with wells must be analyzed, and any appropriate mitigation to avoid such a situation identified.

### **BEST MANAGEMENT PRACTICES**

The exploration, drilling, production, and closing of natural gas wells are technically sophisticated operations that can take many forms. However, best management practices have been developed for each phase of natural gas development. The SGEIS must discuss the best management practices that the Department will develop and implement in the Regulatory Program for the proposed action. A number of these best management practices are discussed below.

#### *NYS GAS WELL INSPECTION PROGRAM*

The SGEIS should describe the current inspection program for gas wells including: budget, number of inspectors, inspector qualifications, and expertise, and frequency of inspections. The SGEIS should determine if the current inspection program is sufficient to address the Marcellus Shale gas development plans. This determination includes the number of personnel, the qualifications and experience of the personnel and the budget assigned to the program. The SGEIS should include a list of current and proposed lease terms and conditions for gas wells, treatment facilities, and transportation systems.

#### *FINANCIAL ASSURANCE*

In New York State well owners are responsible for securing and maintaining financial security to ensure ultimate well plugging and surface restoration prior to commencing any regulated activity, including preparatory work, on the well site. The SGEIS should evaluate whether this amount of financial assurance is sufficient to ensure ultimate well plugging and surface restoration of horizontal wells into the Marcellus Shale. The wells will be longer and more complex to plug and the surface impacts will be larger due to planned high volume fracture stimulation treatments, multiple wells drilled from a single surface well

pad, and the potential need for additional gas treatment and transportation facilities. NYS should consider higher levels of financial responsibility. Some states require as much as \$100,000 to cover a single well.

#### *DRILLING TECHNOLOGY*

The SGEIS should explicitly list the types of equipment and the technology that will and will not be permitted to be used for the development of natural gas from the Marcellus Shale.

#### *GAS WELL CONTROL*

New York Code Rules and Regulations (NYCRR) §556.2(c) requires all gas wells capable of production to be equipped with wellhead controls adequate to contain and control gas flow. This regulation does not require an operator to install a fail-safe automatic surface-controlled subsurface safety valve system capable of preventing an uncontrolled gas releases to the atmosphere, in the event the wellhead surface safety valves fail, or the wellhead is damaged. Many states require the use of sub-surface safety valves to provide a redundant prevention system to prevent gas releases to the atmosphere, to minimize air pollution, and avoid economic waste.

The SGEIS should evaluate whether surface controlled subsurface safety valve systems should be required in the Marcellus Shale gas wells and whether a testing and inspection program for all safety valves should be implemented. The SGEIS should evaluate the need for well control requirements for well work-overs or other remedial operations on the Marcellus Shale.

#### *WELL CASING AND CEMENTING REQUIREMENTS*

Wellbore cementing requirements are designed to ensure that there are sufficient procedures, equipment, and methods in place to guarantee that the casing for all horizontal wells is properly cemented in place. This prevents gas from bypassing the wellhead control system and escaping to the surface via the wellbore annulus and will ensure drinking water sources are protected from contamination. High-angle or horizontal wellbore casing is much more difficult to cement into place than a vertical well. The SGEIS should consider the use of cement bond logs to assess cement integrity, prior to hydraulic fracture stimulation or wellbore production.

A Well Drilling and Completion Report is currently required to be submitted to the state. The report describes the casing and cementing techniques used, but no criteria for the types of casing and cementing are specified. NYCRR §554.4 only states that casing string cementing requirements be consistent with "prudent current industry practices." Additionally, no specific criteria is set for verifying wellbore casing and cement integrity prior to converting existing wells to Marcellus Shale gas producers, either through deepening the well or by sidetracking the well. Sealing an annular space to prevent gas migration is more difficult in a horizontal or multi-lateral gas well.

The SGEIS should review and set specific criteria for casing and cementing requirements for horizontal wells drilled into the Marcellus Shale, or multi-lateral wells (if they will be used) including integrity testing. Casing and cementing techniques should ensure drinking water protection, as well as safe gas production practices to prevent gas from bypassing the wellhead control system and escaping to the surface via the wellbore annulus. The SGEIS should consider integrity testing of existing surface casing systems in existing wells prior to reuse as a Marcellus Shale gas producer, either through deepening the well or by sidetracking the well. Additionally, the SGEIS should consider the use of cement bond logs to assess cement integrity, prior to hydraulic fracture stimulation or wellbore production. The SGEIS should describe which completion methods will be allowed in the Marcellus Shale.)

#### *GAS DETECTION EQUIPMENT*

On-site, continuous gas detection equipment is not currently required during drilling or production operations. Gas monitoring detects gas releases that may result in fire or explosion. Hydrogen sulfide gas (H<sub>2</sub>S) is a flammable, colorless gas that is toxic at extremely low concentrations. It is heavier than air, and

may accumulate in low-lying areas. Flaring operations associated with H<sub>2</sub>S production will generate sulfur dioxide (SO<sub>2</sub>), another toxic gas.

The SGEIS should include gas compositional information for the Marcellus Shale, clearly delineating the potential for H<sub>2</sub>S production. If H<sub>2</sub>S is present in harmful concentrations, monitoring and contingency plans should be developed, as well as criteria for locating drilling and production equipment at a safe distance from sensitive receptors. The SGEIS should consider on-site, continuous gas detection equipment to monitor methane and hydrogen sulfide gas to protect human health and the environment.

#### *WELLBORE PLUG AND ABANDONMENT*

Under the current Regulatory Program, New York State requires gas wells to be permanently plugged and abandoned. An operator is required to submit a "Notice of Intention to Plug and Abandon" to the Division of Mineral Resources regional office. A permit must be received, a state inspector must be on site to observe the plugging operations, and a well plugging contractor that is registered with the Division of Mineral Resources must be used. However, there do not appear to be specific criteria for when a well must be plugged and abandoned. New York State allows operators to submit requests to shut-in or temporarily abandon wells without plugging. Historically, temporarily abandoned wells often have been the source of environmental problems, because operators are not present to monitor wellbore integrity on a routine basis, and aging wellbore infrastructure can corrode and erode, failing over time.

The SGEIS should establish specific criteria as to when a horizontal well drilled into the Marcellus Shale must be plugged and abandoned, as well as criteria for the well plugging contractor to follow to ensure a safe abandonment of a horizontal well or multi-lateral wellbore. Limits should be set on the length of time that a well can be temporarily abandoned. Specific criteria should be set to ensure operators monitor wellbore integrity on a routine basis during the period of temporary abandonment. A one-year limit on temporary abandonment, joined with a monitoring plan during that period is required in other states.

We are please to have the opportunity to submit these comments to the Department. We are committed to working with the Department to ensure that any development of natural gas from the Marcellus Shale is done only where appropriate and in such a manner to ensure protection of the environmental and public health. If you have any question or comments, please do not hesitate to contact me at (212) 727-4524. NRDC, and its consultants and partner organizations in the preparation of these comments, are available to meet with you at your convenience to discuss these comments.

Sincerely,



Kate Sinding  
Senior Attorney